Biofuels laid bare

The subject of biofuels has raised more questions than it has provided answers for transport engineers. John Challen was among those at the IRTE's biofuels conference, looking for clarification

"Road transport needs to look at all tools in the toolbox"

Phil Moon, DAF

The great and the good of the transport engineering world gathered at Gaydon's Heritage Museum in September to debate the contentious issue of biofuels, and more specifically biodiesel. Despite being widely used in the UK's commercial vehicle fleets, there are well-known issues relating to the fuel's effects on components such as injectors and filters.

In his opening remarks, chairman John Parry pointed out that the conference could not provide all of the answers. "I've been in this business for some time and I'm confused about biofuels," he admitted.

The first speaker was DAF's product marketing manager Phil Moon. His talk, 'Biodiesel today and tomorrow', outlined where the industry stands, in terms of biodiesel use, and offered predictions for the coming years. "Road transport needs to look at all the tools in the toolbox," he said, referring to the fact that 22% of the UK's CO_2 emissions come from transport, one-third of which is from truck exhaust emissions.

Moon highlighted the growing difficulties with extracting crude oil, pointing to the recent BP Gulf of Mexico disaster as evidence of that. He claimed such events were forcing manufacturers and operators to look at alternative fuel sources, such as biodiesel. The DAF man also noted the predominant feed stocks used in biodiesel – rape seed, soya, palm oil, sunflower oil, used cooking oil and tallow. And he reminded delegates about the recent increase in bio content under EN509:2009, which mandates that all manufacturers' vehicles should be able to operate with a 7% biodiesel blend.

Some good, many bad

Among the benefits of biodiesel, said Moon, are a reduction in soot and harmful gas emissions from vehicle tailpipes. He claimed near zero levels of sulphur, for example, and also pointed out that biodiesel is biodegradeable.

However, on the negative side, he pointed to reduced cold start performance, as well as more frequent maintenance stops, mostly caused by shorter life expectancy of the oil filters. Moon also mentioned lower energy density, causing vehicles to experience reduced power from time to time, and, depending on fuel stocks, greater fuel consumption. "Biodiesel is hygroscopic, so prone to water absorption and hence bacterial growth," he added, "which can affect the vehicle and the operator's storage capacity. It is also aggressive on rubber components, such as the hoses in fuel systems and tanks."

Moon believes the future of biodiesel depends on the willingness of government to invest in a biofuel infrastructure. However, he also points to concerns that increased investment in crops for fuel means growers may increasingly abandon production for food – which could, in turn, impact the cost of living.

That said, he maintains that biodiesel will become more prevalent and would like to see more DAF applications using it. "It is a real opportunity that we need to take," he said. And he added: "Operators looking at other fuels [such as natural gas, biomethane and LNG] will appreciate that there are complexities with the alternatives and that liquid fuel is a boon, in terms of energy density for trucks."

Fuel for thought

The fuel provider's point of view came courtesy of Robin Lloyd, biofuels and technical manager at Mabanaft, which is responsible for 3% of the UK's road fuels. Lloyd started by pointing out that, while incentives used to be offered by the UK government (to compensate for the extra costs involved in manufacturing biodiesel), these were withdrawn last April. They were replaced by the Renewable Transport Fuels Obligation (RTFO), which, he claimed, is forcing

"We are doing more fuel testing and measurement work"

Robin Lloyd, Mabanaft

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the industry to move from a 'carrot' to a 'stick' approach. He then explained that the RTFO of 3.5% offers no incentive – just a penalty for non-compliance.

Mabanaft is concerned with blends of biodiesel and Lloyd indicated that there can be problems. Waxing, he said, was one that had led users to complain that filters on their buses or trucks had become clogged. However, he argued that there is no good or bad biodiesel blend and that they all have a role to play. He also said there is no good or bad feedstock – just badly processed stocks.

Lloyd also revealed that his own company buys biodiesel without additives, because there can be additive to additive interaction. "It would be great to buy the best products, but there are commercial and supply issues. We are doing more fuel testing and measurement work, and trying to get factors right – including water content, flash point and the FAME [fatty acid methane esters] content," he explained.

Meanwhile, Lloyd confirmed the concerns that some in the industry have with biocides and advised fleet managers only to use them sparingly. However, Mabanaft has, he said, made progress with bacteria content and insisted that the number of blockages caused by waxing has been steadily reducing – despite two cold winters. More work is still being done, he added, monitoring bacteria and looking for better biodiesel management methods.

Manufacturer's view

Next up, Carl Firstbrook, technical support manager for MAN UK, aimed to quash the myths around biodiesel costs for operators.

First, in terms of supply, he urged delegates to use a recommended and reputable supplier for biodiesel. As for direct operator costs, he urged delegates to consider vehicle purchase, warranty, R&M, fuel storage and fuel additives. "These are the main areas where you would expect to see costs higher than if you were using standard pump diesel," he asserted.

Firstbrook believes that no-one is using biodiesel for its environmental benefits: the real driving force is reducing operator fuel costs. He also highlighted the fact that more local authority contracts are dictating that alternative fuels must be used, for example, in RCV (refuse collection vehicle) fleets.

That said, the biggest cause of rising vehicle costs with biodiesel is water, as the fuel absorbs this. "According to the EN 590 specification, diesel fuel should contain no more than 200ppm of water," he confirmed, adding that the upper limit of water content for EN14214 (the European standard for FAME-based biodiesel) is 500ppm.

Buying biodiesel

So what should you look for when buying a vehicle to run on biodiesel? Firstbrook advised talking to manufacturers to find out the detail of an engine running on biodiesel and any warranty issues. "Most new vehicles will have hoses and seals to cope with biodiesel, so the problems are reduced," he said. "But some vehicles require specific components, so make sure the workshop and maintenance staff know that a bespoke filter needs to be used, for example – to prevent unfiltered biodiesel getting through."

"Most new vehicles will have hoses and seals to cope with biodiesel"

Carl Firstbrook, MAN UK

"We need to be told the best solutions"

Graham Belgium, First Group

He then went on to talk about purchase and R&M contracts. EN 590 with 7% biodiesel should be covered as standard, he said, but don't assume anything above that will come under warranty. "Don't expect a truck or engine manufacturer to pay for defects after you have put a particular fuel into the tank," he warned. "And make sure you ask about ancillary equipment, as many components, such as those on the fuel system and the exhaust, will be excluded from warranty."

Firstbrook explained that some companies ask for insurance upfront, but again added that it's unlikely to cover use of substandard fuels. "So, again, make sure premium grades are used," he said.

Maintenance-wise, Firstbrook advised asking what additional measures R&M providers are taking – and to ensure that they are aware, if you are using blends above 7%, in order to ensure that appropriate equipment is fitted to cope with the biodiesel. "The main areas to look for are the fuel filter change period, water trap cleaning, engine oil and filter change period, and fuel tank drain and inspection," he offered.

Possible reasons for non-scheduled repairs, he said, would typically include clogged fuel filters, microbial infections, water contamination and a tarnishing effect on some components. Firstbrook also touched on fuel storage and problems with biodiesel shelf life. "If you are standing down a vehicle, ensure you drain the biodiesel out of it," he advised. "The risks and costs for a vehicle are always higher with the higher percentages of biodiesel."

Next, First Group's Graham Belgium talked about the impact of biofuel on his company's fleet of buses. One issue he had with biodiesel was that many of the new vehicles he invests in every year (in contracts worth £100 million) had worse fuel consumption figures than those that are being parked up.

He backed this up with figures showing that, using B5 and B7 biodiesel blends, vehicle consumed up to 3% more fuel, translating, on his fleet, to 4–6m more litres of fuel per year. At an extra cost of around £2–3 million, Belgium asked: "Are we actually seeing benefits from biofuels? Blending gives inconsistent qualities and biodiesel is now more expensive than pump diesel, so we pay £1.4 million extra for using it."

Belgium also told a story about running one bus on 100% biofuel, using graphics to show damage to the injector and depicting debris in the injector nozzles. And he confirmed that he has been talking to BP about fuel quality. "I implore engine and fuel manufacturers to use sensors on the fuel injection system and to adopt a system that is self-cleaning," he urged. "Engine manufacturers: you need to solve this problem. I can't keep throwing my money at it."

This year alone, Belgium estimates biodiesel has cost his company between £5 and 6m, but conceded that he could have saved money by being better prepared or getting advice from fuel providers.

"We need to be told what the best things to do are," he maintained. "We don't know how biodiesel is affecting the rest of the fleet, as we have only been running B7 for six months. But we have seen increased filter use this past winter and we encourage changing them, because I can't afford the vehicles to be off the road."

Incidentally, he also reported having serious problems with catalytic converters on buses, possibly due to their failure to reach optimum operating temperatures. This, he said, amounted to a further cost, with each replacement trap costing £2,500.

Although Belgium still forecasts big things for biodiesel in the future, he now questions whether moving to a B10 maximum blend makes sense. "Do we really know the CO_2 benefits [of B10]?" he asked. "Has anyone done the well-to-wheel analysis?"

'Look at other products to improve fuel consumption"

Michael Coyle, M2 Training

Water, water

The last speaker of the day was M2 Training's Michael Coyle, who discussed research from Germany and the Netherlands that claims mutagenic materials within biodiesel could lead to health problems, such as cancer.

Coyle explained that his company has been looking for a solution that can treat water in biodiesel and prevent bacterial growth. Normally treated with biocides, Coyle maintains that his solution is more cost effective and also more effective. In a video presentation, he demonstrated how an emulsifying agent prevents water from affecting the fuel and starves bacterial infection.

He explained that M2 has been working with Mercedes, which says the use of B100 biodiesel cuts oil change periods from every 100,000 to 30,000km. The answer, he said, is to run the mildest blend and speak to oil specialists. He also pointed to the rule of thumb, which says that, for every 10% of biodiesel, fuel consumption increases by 1%. How to stop that increase? "Look at alternative products to counteract and improve fuel consumption," he said, maintaining improvements of between 3–4% can be made.